Credits

Funding

Association of Bay Area Governments
San Francisco Bay Trail Project
101 8th Street
Oakland, CA 94607-4756
(510) 464-7935
www.baytrail.org

Coastal Conservancy
1330 Broadway 11th Floor
Oakland, CA 94612
(510) 286-1015
www.coastalconservancy.ca.gov

Sunnyvale Bay Trail Partners

Association of Bay Area Governments
California Conservation Corps
Cargill, Inc.
Coastal Conservancy
Lockheed Martin Missiles & Space
Santa Clara County Parks & Recreation
Santa Clara Valley Water District
Sunnyvale City Council; Parks and Recreation Commission

Activity Guide Development

Julie Oliver, Parks Supervisor-concept and management
City of Sunnyvale - Sunnyvale Baylands Park, P.O. Box 3707, Sunnyvale, CA 94088
baylands@ci.sunnyvale.ca.us
www.ci.sunnyvale.ca.us/baylands

Holly Peters-layout and graphics
City of Sunnyvale, P.O. Box 3707, Sunnyvale, CA 95014-1822
hpeters@ci.sunnyvale.ca.us

Neva Schuelke-research and writing
20972 Greenleaf Drive, Cupertino, CA 95014-1822
nevawrites@home.com

Environmental Volunteers Inc.-educational concepts and some guide activities
3921 East Bayshore Road, Palo Alto, CA 94303
(650) 961-0545
info@evols.org *www.evols.org*

Table of Contents

Activity Guide Development

The City of Sunnyvale has long had an interest in preserving and promoting awareness and understanding of the baylands environment. With the development of the Bay Trail, the City has the unique opportunity to combine its efforts and resources with those of the Association of the Bay Area Governments (ABAG) and the Coastal Conservancy to promote education about wetlands and salt marsh environments in the South Bay. Though the Sunnyvale baylands is not a pristine natural environment—much of the wetland environment at the far south end of the Bay is reclaimed farmland and salt ponds—its history of multiple land uses makes it easily accessible and an excellent resource for observation and study of wildlife. The materials in this guide are designed for students in kindergarten through fourth grades. Adult educators are encouraged to select and modify activities to fit the appropriate age level of the students whom they are leading. Many of the activities in this guide are adapted from activities in the Sunnyvale Baylands Park Site Guide developed by and for the Environmental Volunteers, a non-profit organization which provides volunteer-led, hands-on natural science education to elementary school-aged children in Santa Clara and southern San Mateo counties.

Educational Skills

The activities in this guide will aid in the development of a number of process skills defined/recognized by the State of California.

Observing—inspect; watch carefully with attention to detail and the intent of arriving at a judgement; make a scientific observation on or of; come to realize or know.

Communicating—share; convey knowledge and information about; make known; reveal by clear signs; transmit information; connect.

Comparing—examine the character and qualities of things in order to discover resemblances and differences; view in relation to; show the relative values; note whether the characteristic qualities are similar or divergent.

Ordering—arrange; organize; put things in their proper place in relation to each other.

Categorizing—to classify, to gather or divide into distinct groups.

Relating—give an account of; show or establish logical or causal connection.

Inferring—derive a conclusion from facts and premises; point out; suggest.

Applying—use for some practical purpose; put into action, operation or effect; make relevant.

Educational Objectives

Each of the activities in this guide will address one or more of the objectives listed in the Science Content Standards for California Public Schools—kindergarten through twelfth grade. Please note that this activity guide has been prepared for use with students kindergarten through fourth grades.

Educational Subject Areas Addressed in the Guide

•Physical, Earth and Life Sciences • Math • Language Arts • Social Studies • Art • Music

Principles of Environmental Education

(Adapted from material developed by the Environmental Volunteers)

• Stewardship

Stewardship is a principle based on the idea that humans are animals who are capable of changing the balance of Nature…and we know it. Because we know that we have the power to reshape our environment, we also carry the weight of responsibility for our actions and for the consequences of our actions. Stewardship implies both caring and conservation. We must weigh the impact of our actions on all other species within the environment against the benefit those actions will bring to us.

• Interrelationship of all things

The environment is constantly changing. Nothing exists in isolation. Interconnectedness is like a large web. A change in one species or element affects everything else, shifting the balance, shaking the web.

• Sensory Awareness

We use our five senses to interact with our environment. We learn about our surroundings through touch, taste, smell, sound, and sight. These are the ways in which we get to know about other organisms that share our environment and about changes in the environment.

• Consideration of Values

Values help us to identify what is important to us in our environment. Values help us to decide how we think about our environment and our place in it and also about how we act within that environment. Stewardship and responsibility for our actions are examples of values that aid us in environmental education.

• A Sense of History

It is important to remember that everything is becoming something else. This applies to the smallest seed or larva, as well as to the highest mountain. Everything changes. When we look at the environment around us with a sense of the history, both of the physical geography and of the biological geography, we are better able to get a sense of how we can help affect future change. Do we want to fill in more of the Bay to expand an airport? Do we want to reclaim a salt pond to expand the wetland habitat for birds? Do we want to encourage more people to move to the Bay Area? Do we want to make an effort to preserve wildlife habitat for future generations in the Bay Area? Our sense of how things change over time and of how we can affect them will help us to make these decisions and many others, large and small, that come our way.

Brief History of San Francisco Bay Area & Development of Bay Trail

There have been people living in the greater San Francisco Bay area for more than 8000 years. The indigenous peoples of the area are commonly referred to as the Ohlone (oh-LOAN-ee) today. Before European settlement of the region, the Ohlone lived throughout the Bay Area in small tribal groups with populations of a few dozen to a few hundred each. Many of these tribal groups were located along the edge of the Bay. There the Ohlone hunted, fished, and lived in harmony with the environment, changing it very little to suit their own needs. Everything that they used came from their surrounding environment, and was then returned to the environment.

The first Europeans in the area arrived in the mid 1700s. These first explorers were Spanish missionaries who traveled up the west coast from Mexico. As they traveled, they established settlements and built missions. They introduced agriculture to the Bay Area, and within a few decades they had dramatically changed the landscape of the Bay Area and the lives of the Ohlone. By the early 1800s, the majority of the Ohlone had died of diseases brought by European settlers, and the rest were assimilated into the Mexican population of the Spanish missions and rancheros in the area. The Ohlone that survive today also have Mexican and European ancestors.

From 1800 to 1950, agricultural, industrial, and commercial growth in the Bay Area had led to the filling of 85% of the wetlands surrounding the Bay. Evaporation ponds for the production of salt were a large part of this change. By that time, the remaining wetlands were being filled in at a rate of four square miles per year. In 1965, citizens began reacting to the devastation of the Bay environment spurring the establishment of the BCDC (Bay Conservation and Development Commission) through the McAteer-Petris Act.

The San Francisco Bay Trail is a planned recreational corridor which, when complete, will extend for approximately 400 miles around San Francisco and San Pablo Bays. This bicycling and hiking trail will connect nine counties and forty-seven cities. The Bay Trail came into being through the introduction of legislation in 1987, Senate Bill 100, by then State Senator Bill Lockyer. This bill, enacted into law, directed ABAG (Association of Bay Area Governments) to develop a plan for this "ring around the bay". The Bay Trail Plan, adopted by ABAG in 1989, included proposed trail alignments and policies for selection, design, and implementation of the trail routes, as well as strategies for implementation and financing. The San Francisco Bay Trail Project was created by ABAG in 1990 to help plan, promote, and advocate implementation of the Bay Trail. The Bay Trail Project provides grants for planning and implementation of trail development and maintenance. The Bay Trail has widespread support within Bay Area communities. Most have passed resolutions of support and have included the Bay Trail in their general plans—more than half of the Bay Trail has been developed and is open to the public, including the portion of trail within Sunnyvale.

Approximately 3-1/2 miles of the Bay Trail lie within the borders of the City of Sunnyvale, extending from Calabazas Creek west to the border of federal lands next to Lockheed Martin Missiles & Space. There are portions of the trail yet to be developed both east and west of Sunnyvale. To the west, the trail is planned to cross federal property and connect to Shoreline Park in Mountain View. To the east, the Bay Trail is planned to go through portions of San Jose and Alviso connecting to the Don Edwards National Wildlife Refuge.

With the continuing effort of the San Francisco Bay Trail Project and the cooperation of Bay Area governments, agencies, and land owners, the dream of a complete "ring around the bay" will one day become a reality.

Bay Trail Activities

The following pages contain descriptions of various activities for young children (grades K-4). Adult leaders can select those activities that best suit their needs and the interests of the children they are leading. It is important to remember that we share the trail both with the wildlife that lives on or near it, and with other people who wish to use the trail. There is a long standing principle, "Take only memories and leave only footprints", regarding our interaction with the natural environment. Thank you for honoring this principle by following the trail use guidelines outlined below.

Trail Use Guidelines

- **Stay on established paths**
- **Be respectful of the wildlife and habitat.** Do not chase or handle wildlife unnecessarily. Remember that this place is their home and we are only visitors here. Be a good guest. Students should not capture, pick, or handle specimens unless specifically instructed to do so by a qualified adult. Students may not collect or damage anything in this habitat.
- **Try not to disturb others using the trail.** Select places along the trail where there is room to step to the side of the trail for activities. Avoid making unnecessary noise along the trail. It is disturbing to both wildlife and to others using the trail. If students become unruly, return them to the trailhead rather than letting them continue to create a disturbance to wildlife and others. It is suggested that one or more activities be attempted to regain focus before this action is taken.
- **Pack litter out.** If students eat lunch or snacks along the trail, they should be certain to take all of their trash out to an appropriate trash receptacle. Do not leave food along the Bay Trail. Human food is not the best diet for wildlife. We wish to leave the Bay Trail as beautiful as we find it.
- **Students should dress appropriately.** Weather on the Bay Trail varies from cold, wet, and windy to hot, dry, and still. If students are uncertain about conditions, suggest that they dress in layers that can be shed as they get warm. A windbreaker with hood will work better than a hat on a windy day. A backpack or fanny pack with space for extra clothing, a bottle of water, and possibly a snack is a good idea.

Bay Trail Scavenger Hunt

Objective

Students observe the diversity of living creatures and non-living things in the surrounding environment, record and report these observations.

Materials

Scavenger hunt list (see below), pencil, clipboard, field journal

Scavenger Hunt List

Animal's home
(describe and name animal)
Predator
Plant taller than you are
Plant shorter than your knees
Plant with seeds on it
Plant that is blooming
Animal *scat*
SMaRT Station
Group of animals, not people
White bird
Feather
Butterfly
Something furry
Something sharp
Something long and thin
Something round
Something black
Bird with yellow eyes
Something beautiful
Five things man-made
Something soft
Something noisy
Something unexpected
Pickleweed*(Salicornia)*

Activity

Select a volunteer to read the list out loud to the group so that everyone knows what to look for. Begin this activity early in your walk and stop periodically to remind everyone in your group of the items they need to identify. (A variation: if there are enough people in your group, assign each person one or two specific objects from the list to find.) When you check off the item, write down any specifics that will help you identify it later ("seed fluff on tall grass", "caterpillar on fennel plant", "hole at side of trail"). Go over the list at the end of your walk and ask if anyone can remember seeing any of the items not already marked. Use this opportunity to wrap up by noting what other interesting things they do remember seeing on the walk. Make a note of these additional items so that they can be discussed, researched, written about, or drawn later.

Follow-up

- Have each student select something from the list and research more about it. They can draw or write or read aloud or talk about what they've discovered to share their new knowledge with the rest of the group.

- Have each student take a single item from the list or something else they saw on the hike and make a list of characteristics that fits that one thing (Example: Mallard duck - a bird with a yellow bill, a bird with webbed feet, something that floats, something that *dabbles* in the mud for food).

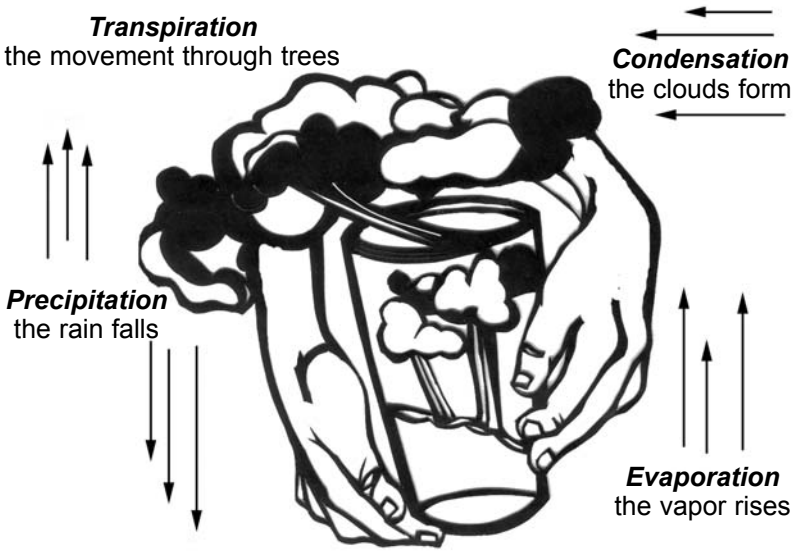
- Have the students make up their own list for a scavenger hunt and take a second hike along the Bay Trail to see if they can find objects that fit their descriptions.

Activity

Pass around a hand lens and have the students breathe on the glass. Discuss the existence of water in living bodies. Who and what needs water? How do we get water? How do the animals we observe on the Bay Trail get water? How do plants get water?

Find three different kinds of plants along the trail and enclose a branchlet of leaves (still attached to the plant) in a plastic bag (with younger students, the adult should probably do this part to minimize damage to the plants). **Note:** It is best to find branches of leaves that are in the sun, but a little back from the trail so that they won't be disturbing to, or disturbed by, other people using the trail. Attach a DO NOT DISTURB sign to the plastic bag tie off.

Discuss the water cycle (diagram in Appendix B). If working with a group, have each student speculate about where the water goes next. Use the local environment as the focus. How does water get into the bay? Is there more than one source? What happens to the water in the bay? Examine a map of the bay, show the outlet to the ocean and locate creeks that drain into the bay. Where does the water at the water treatment plant come from? Since all living things need water to survive, discuss how water gets into and out of living things. How many ways do the students use water? What happens to water we let run down the drain? (You may choose to save some of these questions for later discussion.) What is the difference between *perspire* and *transpire*? Later in your walk, go back to the plants and observe the plastic bags. (Do they have moisture on the inside? Where did that moisture come from? Do some plants give off more moisture than others? What might plants do to conserve moisture?)



Water Water Everywhere

Objective

Students know how to observe and record the loss of water (*transpiration*) in a variety of baylands plants. Students know the various forms of water in the environment and relate what they observe on the Trail to the water cycle.

Materials

Hand lenses, plastic sandwich bags with closures, 3x5 cards, cellophane or masking tape, black felt pen, paper, clipboard/field journal, pencil.

Follow-up

- Study the water cycle more extensively and have students illustrate their understanding of the water cycle.
- Study some plants and animals that live in places where there is little water. How have these creatures adapted to survive on a limited water supply?
- Do a classroom experiment with celery stalk tops. Put each stalk in a different glass, one without water, one with clear water, and one with water tinted with food coloring. Observe the celery in each glass once a day for three days. Make notes about the appearance of each stalk. Discuss what has happened with each of the celery stalks over the three days. How does water move through each celery stalk? How can you tell?

Bay Trail Picture Scavenger Hunt

Objective

Students learn to observe their environment and become more aware of the variety of living things.

Materials

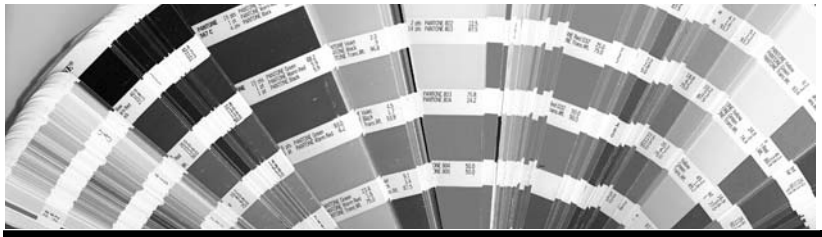
Picture Scavenger Hunt Sheet (Appendix A)
clipboard, pencil

Activity

This scavenger hunt is best for younger students, who may more easily match a picture than a string of words with a living creature that they see along the trail. Each student or small groups of students will have a pencil and the Picture Scavenger Hunt Sheet on a clipboard. Everyone in the group is encouraged to be observant while walking along the trail. You may want to work on other activities along the trail, stopping intermittently to check the sheet for any creatures, which might be nearby. At the end of the walk, look at the creatures that are circled and at the ones that are not. Speculate about why some creatures were not visible on your walk today. Was the group too noisy? Was the season or the weather or the time of day wrong for this particular creature to be visible? Remember that you can circle a creature just from clear evidence that it lives in the vicinity. For example: a gopher from seeing a hole and mound of dirt; a jackrabbit from seeing the scat in the grass beside the trail. Plants may be dormant at the time you visit. Can you see traces of them from seed pods?

Follow-up

- Research one of the animals or plants you saw and report three interesting things that you found out about it.
- Research one of the animals or plants that you didn't see and report on possible reasons why you did not see it.
- Make a poster for the Bay Trail showing pictures of the plants and animals you saw on your walk.
- Make a puppet of one of the animals or plants you saw and have it talk to the class about its life in the baylands.



Colors of the Bay Trail

Objective

Students observe and report on the diversity of color represented in the baylands environment.

Materials

Various colors of paint chips, including bright and primary colors, usually available at the local hardware or paint store, clipboard, paper and pencil for recording the finds

Activity

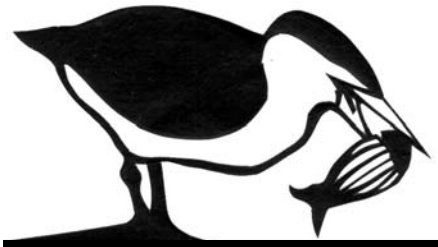
Explain to the students that you are going to do a little detective work on this portion of your walk. You want to discover something about the diversity of color along the Bay Trail. Ask the students to look around and tell you what colors they see that are most dominant along the trail. Pass out the paint chips, one or two per student depending upon the size of your group, and indicate the amount of time you wish to spend on this activity.

Assign each student a section of trail and give them the assignment of finding something natural (no litter or man-made objects) on or next to the trail that matches as closely as possible the color on their paint chip. When they have found their color, they are to stand near it and raise their hand until you come over to help them identify what they have found. Record it so that the group can see and discuss it later. When the leader has recorded all of the finds, have each student show the group what he or she has found. Were there certain colors that could not be found? Were there colors that the students were surprised to find in nature? Take the list and the paint chips back to class to use in follow-up activities.

Follow-up

- Have the students create a piece of artwork, using whatever medium is available or the students choose, that depicts a scene along the Bay Trail and reflects the diversity of color that they discover.

- Gather a collection of nature magazines and have each student create a picture collage to match or blend with the color on their paint chip. Display the student's artwork as a reminder of the color diversity we find in nature.



Food Chains
Looking at the Evidence

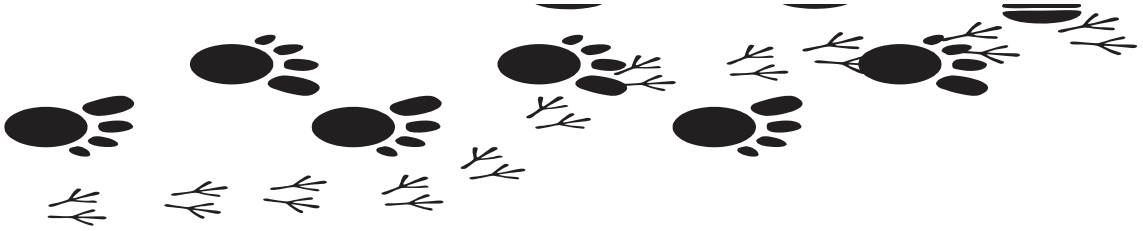
Objective
Students observe the evidence of common plants and animals along the Bay Trail, relate the evidence to the concepts of food chains and food webs, and make inferences about the relationships of various organisms in the environment.

Materials
Clipboards with blank paper, sketchbook, pencils, guidebooks or descriptions and sketches of common baylands species, camera (optional)

Activity
Before going out to the Bay Trail, research some of the more common species of plants and animals found along the trail. These might include: marsh hawk, mallard, coot, ground squirrel, great egret, gopher, killdeer, pygmy blue butterfly, honey bee, ants, mustard, orb spider, funnel spider, red wing blackbird, fennel, pickleweed, cattail, snails, worms, algae, and burrowing owls.

Along the trail, search for and identify these species or evidence of them. If you have a camera, take photos of evidence. Make a list of the species you observe or have gathered evidence of—for example: a mound or hole may indicate that a gopher lives along the trail; or a web indicates the presence of a spider. Look for interconnections—for example: ants feeding on the body of a dead blackbird; an egret hunting in the mud at the edge of the slough; a honey bee on a fennel blossom.

Follow-up
- Discuss what would happen if one species in your food web were to disappear. What would happen to the other species?
- Discuss what happens when plants and animals die? What becomes of their physical remains? Why isn't the Bay filled with piles of dead birds and fish? Where do they go when they die? How do they contribute to the continuation of life in the baylands environment?
- Back in the classroom, research what each of the species on your list needs in order to survive, what food they eat, and what they are eaten by. Then, using the information and evidence you have gathered, create a food chain/web including and connecting as many of the species on your list as you can. You may use words, drawings, and/or photos to create your food web. It may be simple or quite complex. Life along the Bay Trail is diverse.
- Using photos or drawings, yarn, and push pins, create a food web on a classroom bulletin board. Have each child research one or more of the plants and animals in your display in more depth and report on their particular species to the rest of the class.



Activity

As you proceed along the trail, have the students watch for burrows, tracks, scat, and webs that show evidence that various animals live on or near the trail. Have someone record what is observed. Ask the students to guess what animal might have left this evidence. Once relatively certain of the probable animal that left the evidence, ask them to estimate how large the creature is. Perhaps they have seen this animal in the past. Older students might be encouraged to make their estimates in inches or centimeters, while younger students may want to make estimates relative to familiar objects (a ground squirrel is about the size of a hot-dog bun, with a slender bushy tail added).

Follow-up

- Research the sizes of some of the animals you identified on the trail and compare them with your own estimates. How did you do?
- Have the students write a story about one of the animals discussed in this activity, including the evidence you found along the trail.

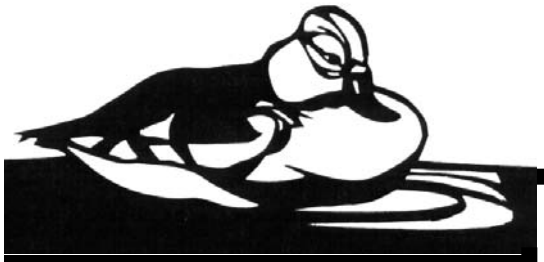
Animal Sizes

Objective

Students observe evidence of animals—burrows, tracks, webs, and scat—along the trail, then infer the identity and probable size of the animal; and relate this to something familiar from their own environment.

Materials

Measuring tape, clipboard, paper, pencil for recording observations and measurements



Bird Watching

Objective

Students observe birds in their natural environment and become familiar with the diversity of bird species inhabiting the baylands.

Materials

Binoculars, regional field guide, clipboard, paper, pencil and field journal

Care & Handling of Binoculars

Learn to use the binoculars and teach students how to use them, before going out on the trail.

Notes on binoculars: Viewing power is described in numbers, i.e. the first number is magnification; second number is the width of the large lens, in millimeters. For example: 8x30 magnifies subject 8x and the lens is 30mm in diameter. The larger the lens, the brighter the subject will appear. Warm binoculars to air temperature to avoid fogging. Keep lenses clean, blow away dirt and debris with compressed air then wipe with a soft, dry, clean cloth, making sure there is no grit before using the cloth. Keep your eyes on the bird and raise the binoculars to your eyes. Don't look down-you may lose sight of the bird! Focus each eyepiece separately and use the central wheel to bring birds close or far away. Wear a strap around your neck when using binoculars to avoid dropping them.

See Appendix E for a list of birds common to this area and use it to mark pages in the field guide.

Activity

As you walk along the trail, give each student an opportunity to identify a bird or group of birds. Have them look at the bird through binoculars, and then give others a chance to look at it as well. Let the student who originally spotted the bird help you find it in the field guide or reference card you are carrying.

Make a note of the type of bird you've identified and any other information, such as identifying colors, sex-related markings, habits you observe, page number in field guide, etc.

Make sure that each student in the group has an opportunity to be a spotter for at least one bird. And, try to find a different type of bird for each student, unless your group is very large. The numbers and types of birds in the South Bay wetlands vary with the seasons and with the weather. Be sure to look for birds in the water, marsh, and sky. Take your list back to the classroom for follow-up activities.

Follow-up

- Have the students make a poster or posters featuring birds of the Bay Trail. Discuss why the bayland environment is attractive to so many different birds. Why is it important to the birds that we clean up our water before we let it flow into the bay?
- Let each student research and report on the bird that they spotted on the trail.

The San Francisco Bay area is part of one of the major flyways in North America. Discuss what a flyway is, what that means and why this area would be so attractive. A note on *flyways*: "Flyway" is a concept defined by Frederick Lincoln, a waterfowl biologist, in 1952. This concept formed the basis for much of the Fish and Wildlife Service's policy for waterfowl as resource management with regards to hunting regulations. Simply stated, the flyway concept was used to describe habitual and ancestral migration routes of some bird species.

The Pacific Flyway stretches from the Gulf of California to the south, Hawaii and Pacific islands to the west, crest of the Rockies on the east and reaches as far north as the tundra regions of Canada and Alaska.

zí zí

hoohoo-hoohoo-hoohoo—hoohoohaw

kum-kum-kum peep peep GOWK-cowk GOWK-cowk

p—wee-e-e-e—e

hoohoo-hoohoo-hoohoo—hoohoohaw

peep

Sounds of the Bay Trail, Present & Past

Objective

Students focus on the information that can be obtained about the environment through listening. Students are able to report on auditory observations.

Materials

Clipboard, paper, and pencil

Follow-up

- For the students in grades 3-4, study the Ohlone Indians who lived in the San Francisco Bay Area and discuss how your walk on the Bay Trail was different than how their walk would have been several hundred years ago.
- Ask the students to write a story or song about the importance of sounds in our environment.

Activity

Ask the students to spread out along one side of the trail and to be very quiet. Ask them to stand in a safe place on the trail, to close their eyes, and to breathe deeply and slowly. Ask them to try to focus on the sounds around them and to try to distinguish four or five different sounds. Let each student name, as best they can, one of the sounds that they hear. Make a list of the sounds that the students hear. Now have them open their eyes. Move to a spot where it is safe for them to sit in a circle for a few minutes (be sure that your group is not blocking the trail to other trail users).

When everyone is seated, ask them to close their eyes. Talk about what the baylands in this area might have looked like one thousand years ago. We know that there were Ohlone Indians living in the area, but no Europeans came to this area until about three hundred years ago. The Ohlone were few in number, only a few thousand all around the Bay, as opposed to a few million people living in the Bay Area today. What kinds of machines and technology did the Ohlone have? When there were fewer people, do they think there might have been more wildlife? More water? More trees on the hills and in the valleys? How would this place have sounded different one thousand years ago?

Ask them to again close their eyes and listen to sounds around them. Ask them to try to focus on a sound that would **not** have been heard in this environment a thousand years ago. Ask a student to identify that sound. Ask if everyone can hear the sound that this child named. Ask if someone else hears a different sound that would not have been heard a thousand years ago. Call on someone to report what they hear. Ask everyone in the group to focus on that sound. Repeat this process until there are no more hands raised, or until it seems that the students are repeating themselves. Now ask them, with eyes still closed, if they hear any sounds that probably **would have** been heard one thousand years ago. Direct them as above.

Continue your walk. Ask the students to try to keep an increased awareness of sound as they complete the walk. Let them identify new sounds as they become aware of them.

Hawk
squirrel eater
swooping down low
freedom in the air
raptor

Bay Trail Poetry

Activity

Near the end of their walk on the Bay Trail, find a place for the students to sit safely and think about what they have seen and heard on their trip through the baylands. Tell them that they are each going to write a poem, and it won't be very hard at all. The poem they will write will have five lines. (For younger students, the adult in the group will want to do the writing as suggested by the students, perhaps letting each student create his or her own poem if the group is small, or letting different students contribute different lines.) If students will be writing their poems themselves, then pass out a lined card and a pencil to each student. Give them instructions one line at a time.

The poem form, *cinquain* is simple:

The first line is one word, naming the subject.
The second line is two words, describing the subject.
The third line is three words, relating what the subject is doing.
The fourth line is four words, how you feel about the subject.
The fifth line is one word, which renames the subject.

Give them about a minute for each line. When they are finished, ask for volunteers to read their poem, or ask if you may read it for them aloud to the group. If there is time, you may be able to read everyone's poem. If not, save some of them to read back in the classroom.

Note: *cinquain* is pronounced "sin-cane" and was suggested by Jean Folsom, an Environmental Volunteer.

Objective

Students practice language arts skills based on observations made during the walk. Help each student to examine observations, inferences and aspects, which they have recorded.

Materials

Lined 5x7 cards, pencils

Follow-up

- Discuss the trip when you get back to class and have the students create a picture or poster that includes drawings of things they saw on their walk and incorporates their poem.
- Have the students write more poetry in the cinquain form to help them remember other things they saw and heard on their walk through the baylands.

A Game of 20 Questions

Objective
Students learn to observe the surrounding environment and to think critically about the characteristics of things in the environment.

Materials
Small slips of paper, pencil

Activity
Select something that you see in the environment around you on the Bay Trail. Write down what it is on a small slip of paper, then fold the paper and hold it in your closed hand so that no one can see it. Tell the students that you have chosen something that you have seen on the trail during the walk and their job is to guess what it is by asking you questions that you can answer with either "yes" or "no". They are limited to a maximum of 20 questions. The student who successfully guesses what is written on the slip of paper in your hand gets to choose the next item, and so on. The game may go on as time allows. If you know that you only have time for one more round, let the students know up front so that they will have set their expectations. No one may have more than one turn choosing the hidden item, so if someone guesses correctly a second time, then he or she will choose someone else who hasn't had a turn yet. Each person must write down what they are thinking of on a slip of paper and hold it hidden in their hand while the questions are being asked. If 20 questions fail to get an answer from the group, the leader may take the hidden paper and reveal one letter at a time as a clue until someone guesses.
Variation: The game can be played by dividing the group into two teams and letting them each have a turn at choosing the hidden item. Huddles for decision making will have to be held at a small distance to keep the answer a secret.

Follow-up
- Have the students select a plant, animal, or object that they saw on the Bay Trail walk and make a list of twenty ways to describe what they chose (example: a hawk flies, has feathers, talons for feet, a sharp beak, needs light to see, has good vision, eats meat, likes to sit on poles, etc.). It may be useful to have students work in pairs or small groups.

Unnatural Trail Observations

Objective

Students are able to observe and know the differences between those objects which are natural to the Bay Trail environment and those which are unnatural (usually manmade).

Materials

Clipboard, paper and pencil, bag and gloves for collecting litter

Activity

As you walk along the Bay Trail, you will notice a number of objects both large and small that are not a part of the natural environment. The trail itself is atop a man-made levee. There are buildings, bulldozers, utility towers and lines, and there are bits of cement and plastic and paper on or near the trail. Designate one person in your group (an adult, if the students are too young to be able to write well) as the scribe for the group and have the students explore a defined segment of the trail and name all of the unnatural objects that they discover along that segment of the trail. If you desire, smaller litter may be collected by an adult in the group (wearing gloves and carrying a trash bag) for appropriate disposal later. After you have a list of unnatural objects that you've observed along this segment of the trail, stop and discuss what you've seen. Are any of the unnatural objects actually important to the natural environment? Are any of them important to people living or working in the area?

Follow-up

- Take the litter you've collected back to the parking lot or to class and spread out the contents of the bag on the ground or on a covered surface where it will be easy to clean up. Examine what was collected. Is there anything in the collection that is recyclable? Is there anything in the collection that is still reusable? Talk about where this litter will go once it is thrown in the trash. What are some of the reusable alternatives to the objects that ended up littering the trail?

- Take a tour of the SMaRT Station. (Appendix F, Resources)

- Sign up to participate in a beach or trail clean-up in your area.

- Have students list ways of reusing and recycling things where they normally create trash. Analyze the trash at school or home to determine what can be recycled, and what disposable items could be replaced by reusable items. (Contact the local garbage company for educational materials on recycling and reusing.)

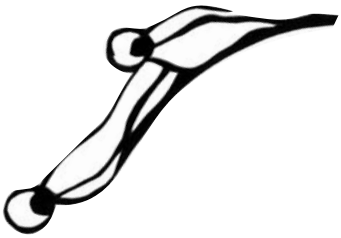
Wind Studies

Objective

Students use the senses of sight, sound, and touch to determine the relative speed of wind at different points along the trail.

Materials

Clipboard, paper, pencil, popsicle sticks or pencils for each child, six inch pieces of light weight yarn or narrow strips of cloth



Activity

It is helpful to study wind and have some understanding of what it is and where it comes from before you use this activity on the trail. Give each student a stick and a narrow strip of cloth. Ask them to tie the cloth onto the stick near one end, using a simple knot so that there are loose ends of cloth hanging along the stick when they hold it upright from the other end. Ask them to walk up and down a designated segment of the trail and using their own sense of touch as well as observing the way the cloth acts when they hold the stick up, find the place where the wind seems to be blowing the most strongly. If the trail is very open here, they may find the wind the same strength throughout the segment. Ask them to try to find a place along this same segment where the wind is weakest. Remind them to test all levels up and down as well as along the trail. Discuss what they discover. Collect the sticks from the students and ask them to observe any plants or animals along this segment of trail. How are they reacting to the wind? Have they made adaptations that help them live in a windy place? How do animals keep from being blown away? How do plants keep from being blown away? How might the wind be useful to either plants or animals? Is there a bush or tree that has more branches on one side? Is there a hawk soaring high up? Are there seeds that are spread by wind? Make notes of your observations and questions that come up.

Follow-up

- Back in the class, look up plants of the baylands area and find out which ones seem to have seeds spread by the wind.
- Set up a wind sock or wind meter outside and keep records of wind speeds over time. Determine whether there is a pattern of wind in your area.
- Have the students do artwork depicting the wind. Discuss their work and what each person used to represent the wind or show the effects the wind is having.

Take a Microhike

Objective

Students observe the abundance and diversity of life in a small area.

Materials

Clipboard, paper, pencil, 2 meter piece of twine, hand lenses, bug boxes (optional), camera (optional)

Activity

Have the students help select an interesting place beside the trail where plants are short or close to the ground. Tie the two ends of the twine together and lay it in a circle on the ground in the area you've selected. Pass out hand lenses and bug boxes and instruct the students to look first for animal life within the circle of the twine. List the names or descriptions of each animal they find and the numbers of each species. (If there are ants, how many?) Be sure that students try not to harm any living thing, while studying it. If bug boxes are used, be sure to show students how to safely capture and release small animals within the circle. When all of the animals are listed, have them study and list the plants present in the circle. How many different grasses can they identify? What makes each plant variety different from the others? List distinguishing characteristics. If you have a good camera, take a picture of the circle and the surrounding area of the trail for your records of the trip and the activity. If you have time, move the twine to another area on a different part of the trail and repeat the process. If you laid the twine on a flat area first, try an accessible hillside area. If you surveyed a grassy area one time, then try a mud or gravely area. Compare the lists from the two areas. Were there more varieties of animals in the area with more plant varieties?

Follow-up

- Try using field guides to identify some of the plants and animals you found within the twine circle. Have students draw as many of the different plants and animals as they can remember from the circle. Use the list of names and descriptions to help them remember their observations. Display the artwork with the list and any photos from the activity area.
- Find stories about small creatures in nature to read in class. Discuss the advantages and disadvantages of being small.

Activity

Devote a good portion of your hike, if not the whole hike, to studying insects along the Bay Trail. You may want to do some research ahead of time and select one or two field guides that will help identify the insects you find and plants upon which they live.

As you walk along the trail, have the students look for insects on the ground, in the air, and on the plants along the trail. If the students will be capturing the insects, distribute the bug boxes and have each student search out an insect. Stress the importance of not harming the insect as they capture it. Ask them to look for ants, ladybugs, and field crickets, which are common in this environment. If only adults will be capturing insects, then have the students locate the insects they would like to look at more closely. Insects that cannot be captured, but will sit on a plant or on the ground for a period of time are also candidates for observation and sketching.

Have the students find a comfortable place to sit or stand and make notes about and sketch their insect. Talk about the insects they find. What type of insect is it? Help them go through the field guide to identify the insect and, if applicable, the plant on which it was found. What do they think it eats? What might eat it? Does this insect live by itself? Does it live mostly on the ground, on a plant, in the air, or in the water? What was it most likely doing when you captured it? When each student has finished his or her observations, the insects should be released gently as close to the place where they were captured as possible.

Follow-up

- Create a classroom display of the sketches the students made during the hike. Have each student share his contribution to the display.
- Ask students to research and write a report on one of the insects observed.
- Observe the insects near school or home. Are they the same as those observed on the Bay Trail? Are some of them different? Were they similar, occupying the same type of plant or place in the environment? Does the same type of insect look the same in the schoolyard as in the baylands? What differences do you notice, and why do you think they are different?

Bug Boxes

Objective

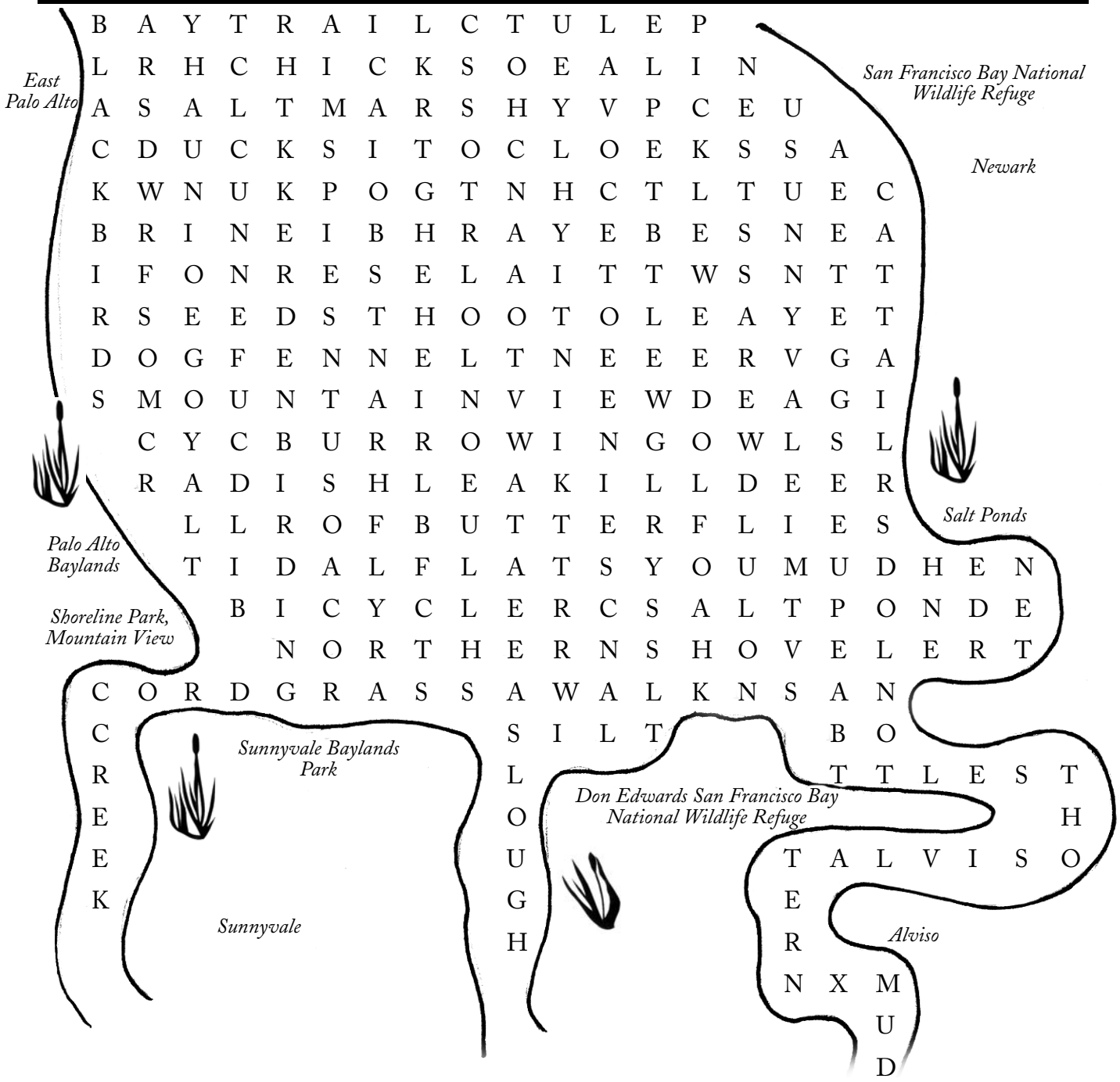
Students will explore the diversity of insect life along the trail by using bug boxes to capture and observe insects more closely. Students observe and record details of small animal life in nature and learn to capture and release without harm.

Materials

Bug boxes (various sizes and shapes can be found at most nature stores), clipboards, blank paper/field journals, pencils (colored pencils), field guides (insects/plants)

Note: Not all of the insects that you see along the Bay Trail will be safe to collect. Honey bees and wasps can give painful, sometimes dangerous stings; other insects,such as butterflies will be too delicate and easily harmed to capture with bug boxes. Spiders are not technically insects, but might be interesting to include in your studies. Some spiders do bite, but most are not harmful. A separate field guide may be needed to help identify spiders. Younger students may need assistance of an adult. It is important to do as little harm as possible in our explorations along the Bay Trail. Flying insects may be especially difficult to capture, and the attempt should only be made if they land in an accessible position.

Bay Trail Word Search



Alviso
avocet
Bay Trail
bicycle
red-winged **blackbird**
brackish *water*
brine *shrimp*
burrowing owls
butterflies
cattail
cordgrass
coyote *bush*
Stevens **creek**
dog fennel
duck
killdeer
migrate
mud
mudhen
nest
Northern shoveler
Ohlone
pickleweed
wild **radish**
salt marsh
salt pond
silt
Guadalupe **slough**
Sunnyvale *Baylands*
tern
tidal flats
tule
walk
wind

Find the words in bold, that are hidden in the puzzle! These words may go across, down or on a diagonal.

Glossary

Algae: tiny, non-seed-bearing aquatic plants with chlorophyll, often masked by brown or red pigment.
Alien: a non-native plant or animal species, also sometimes referred to as introduced.
Arthropod: animals classified in the kingdom Arthropoda, having segmented bodies, jointed legs; includes spiders (arachnids), insects, crustaceans, and myriapods.
Bay: an inlet of the sea; a body of water set off from the main body.
Bayland: another name for the low lying wetland areas surrounding a bay.
Bog: wet, spongy ground with soil composed mainly of decayed vegetable (plant) matter.
Branch, branchlet: a natural subdivision of a plant stem/a small terminal branch.
Burrow: a hole or tunnel dug in the ground (by humans or animals) for shelter.
Camouflage: to disguise or conceal by a change in appearance; in animals such changes often occur naturally as adaptations, such as speckled, brown eggs laid on the ground by shore birds, or the protective brown coloring of many small mammals and birds, to avoid detection by predators.
Caterpillar: the worm-like larva of a butterfly or moth.
Competition: striving consciously or unconsciously for an objective; to be in a state of rivalry.
Cooperation: working or acting together for a common goal.
Cycle: a course or series of events that recur over time.
Decomposer: any of various organisms (such as certain bacteria and fungi) that returns constituents of organic substances to ecological cycles by feeding on and breaking down organic matter (dead plants and animals, and their by-products).
Dabble: to use the bill in a rapid nibbling motion to sieve food from mud or water, a method of feeding so characteristic of certain ducks that the group is defined by the term.
Dike: a barrier of earth designed to keep water contained in an area, usually made of earth and sometimes called a levee.
Diversity: having many differences or varieties.
Ecology: the study of the inter-relationships of organisms and their environment.
Endangered: threatened with extinction.
Environment: influences, circumstances, and conditions affecting the development of an organism.
Evaporation: process of converting a solid or liquid into a gas or vapor, for instance, water heated by sunlight is converted into water vapor in the air.
Evidence: something that furnishes proof.
Extinction: to extinguish; causing to no longer exist.
Fungus: an organism of the group which includes mushrooms, toadstools, molds, and mildew.
Gas: a fluid that has neither form nor solidity and tends to expand indefinitely.
Geography: the science involving the study of the surface of the earth and its divisions into continents, countries, climates, and the distribution of plants, animals, and inhabitants; also refers to the physical features of a given area.
Grove: a group of trees standing together without undergrowth.
Habitat: the place where a plant or an animal normally lives, often characterized by a dominant plant form or physical characteristic (the saltmarsh or grassland habitat).
Impact: the force behind a movement or change.
Insect: any of a class (Insecta) of arthropods having well defined segmented bodies (head, thorax, and abdomen), typically three pairs of legs, and one or two sets of wings.
Interconnected: having multiple and mutual connections among a group of organisms.
Interdependence: mutual dependence among a variety of species of organisms.
Interrelated: brought into mutual relationship
Levee: an artificial bank built along a waterway to prevent flooding or inundation.

Liquid: a fluid (such as water) that has no definite shape, but does have a definite volume and does not expand indefinitely, and is only slightly compressible.

Litter: trash, garbage or wastepaper lying scattered about.

Marsh: a wet lowland; unusually overgrown with coarse grasses, sedges and other plant varieties occurring dependent on the salinity (salt content) of the water.

Mitigation: alleviation or abatement of any severe condition, such as the addition of reclaimed water to former wetlands that have dried up as a result of the building of levees for flood control.

Native: belonging to a locality by birth or origination; indigenous.

Natural: occurring with conformity to the ordinary course of nature; growing without human care; being in accordance with or determined by nature.

Niche: a place or position particularly suited to the person or thing in it.

Nocturnal: active or occurring at night.

Nutrients: the raw materials necessary for continuing life processes.

Peat: partly decayed moisture absorbing plant matter found in bogs or swamps.

Perspire: to excrete through the pores of the skin.

Pollinator: an organism (such as an insect or a bird) or factor (such as wind) that conveys pollen from the anther to the stigma of a flowering plant.

Pollutant: any substance that contaminates an environment, such as automobile exhaust in the air or oil in the water or raw sewage in a river.

Pollution: contamination of the environment, particularly by human made wastes.

Precipitation: a deposit on the earth of hail, mist, rain, sleet or snow.

Predator: an animal (rarely a plant) that captures and eats animals for food.

Prey: an animal or plant hunted by another for food.

Raptor: any of numerous carnivorous birds that hunt and kill other animals (synonym: bird of prey)

Recycle: to return something to a cycle of use, such as nutrients from dead leaves being returned to the soil by decomposition to be used by other plants for nourishment, or an aluminum can being melted down and made into a new can or foil.

Respiration: the act of breathing; in cells, the taking in of oxygen, followed by the release of products of oxidation, particularly carbon dioxide.

Responsibility: the quality, fact, or instance of being responsible, accountable for something.

Riparian: situated on the banks of a river or lake.

Scat: feces; excrement.

Scavenger: any animal that eats refuse; someone or something that consumes, cleans up, or carries off waste.

Seasonal: characteristic of or dependent upon the season of the year.

Slough: a swamp, marsh, or pond, which is part of an inlet under tidal influence.

SMaRT Station: Sunnyvale Materials Recovery and Transfer Station: intra-city facility which sorts garbage from the three cities of Sunnyvale, Mountain View and Palo Alto, primarily to recover recycleable materials and dispose of the remainder.

Solid: substance that does not flow perceptibly under moderate stress and under ordinary conditions retains a definite size and shape.

Species: a class of individual organisms having common attributes and being designated by a common name.

Stewardship: overseeing the care and management of another's property; the earth belongs to everyone, so we are all stewards.

Transpiration: giving off moisture through the pores in leaves or other parts of plants.

Upland: ground elevated above the lowlands, marshlands, or river.

Velocity: rapidity of movement; rate of occurrence.

Weather: the state of the atmosphere in respect to heat or cold, wet or dry, calm or storm, clearness or cloudiness.

Weed: an undesired, uncultivated plant that grows in profusion crowding out desired or cultivated and native plants or crops.

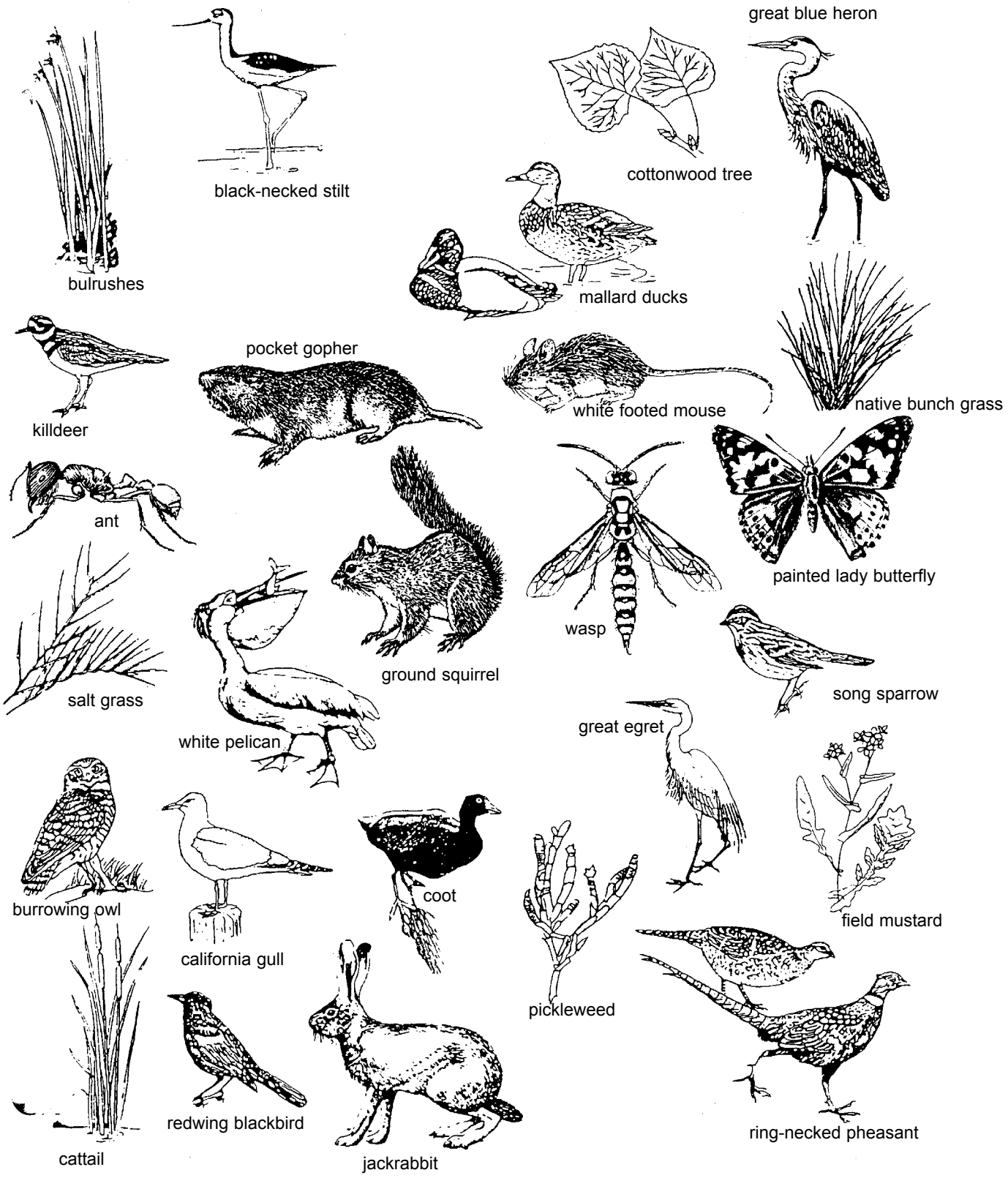
Wetland: areas that, at least periodically, have waterlogged soils, support plants adapted to wet soil, and are covered or occasionally submerged by water. Bogs, freshwater and saltwater marshes, and freshwater and saltwater swamps are examples of wetlands.

Wind Chill Factor: a drop in air temperature directly related to the speed of the wind; the harder the wind blows, the colder the measured temperature, usually one degree per one mile an hour of wind speed.

Common Plants of the Bay Trail

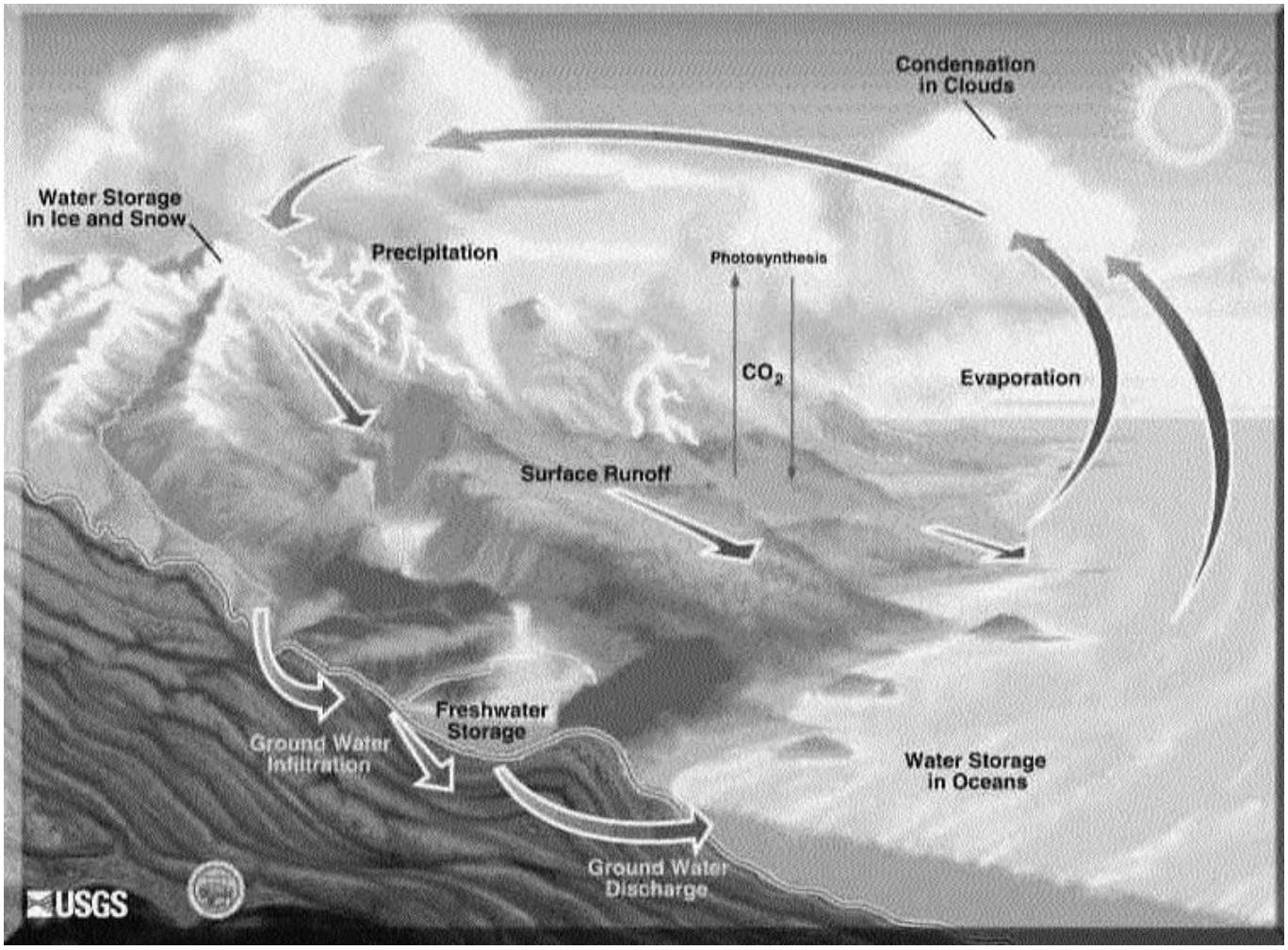
Appendix A

Picture Scavenger Hunt



Picture Scavenger Hunt Key

Appendix B



Water Cycle Diagram

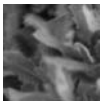
Appendix C

Blackberry, California *(Rubus ursinus)*: They grow in a variety of habitats, mostly in sunny areas near water. Blooms March through August. Leaves are heart-shaped with serrated edges and covered with tiny hairs. Stems are thorny and erect with thinner trailing shoots branching off. White, rose-like flowers produce black berries in late summer. Berries are edible; leaves and roots are used medicinally.

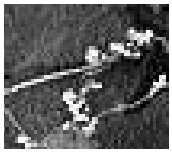
Bulrush *(Scirpus spp.)*: Actually not a rush, but part of the sedge family. Flowers in clusters of brownish spikes atop the main stalk. Two grass like leaves extend above the flower spikes. Grows 0.9 to 2.8 meters tall. Found in water at the edges of ponds, lakes, and in marshes. Roots and young shoots were used as food by Indians.

Cattail *(Typha spp.)*: Club-like sheath of greenish flower spikes atop a long stalk. Grows to 3 meters. Flowers ripen to brownish tufts of hairy seeds in late summer. Common in marshes, ditches, and near rivers and lakes. Provide a vital food source and cover for water birds and wildlife. Roots, shoots, leaves, pollen, and seed fluff were all useful to the Ohlone Indians.

Cow Parsnip *(Heracleum lanatum)*: Large, conspicuous plant with deeply lobed leaves along the length of its thick hollow stem. Grows to 3 meters tall. Dense clusters of creamy white blossoms. Blooms February to September depending on location. Common in moist fields. Though non-poisonous, it resembles similar plants such as water hemlock which are deadly.

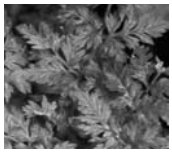


Coyote Brush *(Baccharis pilularis)*: A common chaparral shrub, found at edges of open woods and disturbed areas. Several species native to California. Grows 0.5 to 1.5 meters in height and width. Evergreen with coarsely toothed, oblong, 1 to 3 cm leaves. They are dioecious, meaning that male and female flowers form on separate shrubs. Blooms August to October. Crushed leaves used medicinally by the Ohlone to reduce swelling and soreness.


Dodder *(Cuscuta sp.)*: A parasitic plant with no chlorophyll to make its own food. Small waxy flowers that are bell or urn shaped. Leaves are reduced to minute scales on the thin vine of the plant. Each flower produces one to four seeds which are released and sprout in the ground. The young vine must immediately seek a host plant to survive. Upon contact with a "victim", it attaches itself with sucker-like organs called haustoria (meaning "to drink" in Latin), then the vine from the ground dries up and disappears like a no longer needed umbilical cord. Dodder depends on its host plant to survive. In severe conditions, the host plant may be killed. Usually a dodder plant will spread itself over several hosts allowing all to survive. Blooms May to November. The dodder that grows on the pickleweed in the baylands is one of 15 species in California.


Fennel, Dog *(Foeniculum vulgare)*: Erect perennial herb grows 1 to 2 meters high. Has characteristic anise or licorice odor. Leaves dissected into linear divisions, loosely resembling feathers. Yellow flowers occur in umbels. Blooms May to September. Roots, young shoots, and seeds are edible. The plant attracts aphids as well as having edible flowers and seeds, therefore providing a variety of foods for many birds.


Filaree, Red-stem *(Erodium cicutarium)*: Also known as Storksbill, Clocks, or Pin Grass. A small annual herb with leaves that form a rosette at the base. Leaves are lacy in outline. Stems are slender and weak with fine hairs, 10 to 50 centimeters high. Flowers are rose-purple with 5 petals. Five seeds form at the base of each fruit which is a needlelike structure. Each seed has an attached needle which curls into a corkscrew as it dries, thus the name "Clocks". Found throughout the state in deserts as well as wet and disturbed areas. The young plant is entirely edible. Quail, finches, and ground squirrels are among the animals that eat the plant.


Hemlock, Poison *(Conium maculatum)*: Tall plants with parsley-like leaves on tall purple-speckled stems. Can grow 3-3-1/2 meters high, terminating in large white umbel-shaped flower heads. Native to Europe. Grows in open, sunny areas, often in disturbed areas. Extremely poisonous, producing instant paralysis and resulting in death. Should not be confused with either fennel or cow parsnip which both have edible parts.


Mustard, Field (also Black Mustard, *Brassica nigra)*: Erect annual. Branching from 0.7 to 2 meters high or more. Basal leaves deeply cut. Large terminal lobes and a few smaller lateral ones. Showy yellow flowers on long racemes have four petals. Fruit is an elongated slender pod to 2.5 centimeters. Flowers April to July. Common on dry hillsides and waste places throughout the state. Many other edible species exist and are widespread. Young greens are an excellent pot herb. Unopened flower pods are edible. Seeds are made into prepared mustard. Doves, pheasants, finches, larks, and nuthatches are among the birds that search out the seeds. Ground squirrels and deer eat the plants.


Oats, Wild *(Avena fatua)*: Low to tall grass, 1 to 2 meters high. Flowering structure a loose, open panicle with horizontal branchlets. Greenish flowers have a long, stiff awn that is bent and twisted below. Blooms April to June. Found as a weed in waste fields and disturbed areas. Possibly introduced by the Spaniards. Now spread all over the country. Was gathered by several Indian tribes. Parched seeds were ground into meal. Waterbirds and songbirds frequently feed on the grains.


Pickleweed *(Salicornia.spp.)*: A perennial herb with widely spreading, fleshy stems. Leaves reduced to tiny scales. Grows 15 to 30 centimeters high. Stems jointed. Inconspicuous flowers bloom from August to November. Older plants often turn reddish. Forms mats in salt marshes and low alkaline places. Four species occur throughout the state. Seeds were used by Indians of the western states. Tender green tips were pickled and used in salads by early settlers.


Poppy, California *(Eschscholzia californica):* Delicate yellow-orange flowers and dull green, fern-like leaves. Blooms February to September. Flowers mature into long seed pods that burst and scatter seeds in the late fall. Grows in open areas, mostly in chaparral and along roadsides. Flowers are light sensitive and close at night. Grows to 0.7 meters. Common throughout California, it is the state flower. As with other members of its family, it is known for it narcotic and pain-relieving qualities.


Radish, Wild *(Raphanus sativus):* Freely branching stalk that reaches from 30-120 centimeters in height with lyre-shaped leaves at the base, as long as 15 centimeters with pinnate divisions and large, rounded terminal lobes. Flower have 4 petals, usually white with pink or purple veins, sometimes yellowish. Fruits are rounded pods, approximately 2.5

centimeters long. Blooms February to July. Originally from China, was cultivated in Egypt and the Mediterranean. The root of the cultivated varieties, the leaves, blossoms, and pod are all edible.


Rushes *(Juncus Xiphioides):* Flowers brownish, in spikes. Pods contain several small seeds each. Leaves are stiff, long, narrow, and hollow in cross section. Stem are either hollow or spongy and unjointed. Found in wet places as dark green, grass-like clumps.

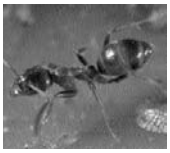

Saltbush, Australian *(Atriplex lentiformis)*: Large evergreen shrub to 2-1/2 meters. Native in coastal California to 100 miles inland. Very tolerant of alkali conditions. All of the plant is edible, young shoots suitable for greens. Indians used the plant for its salty taste. Birds use the seeds for food and the foliage for habitats.


Saltgrass *(Distichlis spicata)* Native perennial grass found in salt marshes or moist alkaline areas. Dormant in the winter, this grass forms colonies, grows from spreading rhizomes and is 4-8 inches. It provides forage and shelter and can often be seen on the banks of levees.


Tule (also Prairie Bulrush, *Scirpus robustus)*: A perennial, grass-like herb with tuber-forming rhizomes. Long, single stems, triangular in cross-section. Grows 0.5 to 1.5 meters tall. Scaly flowers are reddish-brown to straw colored and produced at the tip of the stem. Blooms April to August. Occurs along with larger species of Tule in freshwater marshes, coastal salt marshes, alkali sinks, and throughout the state in wet ground. Grows where cattails grow. Indians dried the roots and ground them for flour. Seeds and pollen were also used for food. Used by the Ohlone for housing, boats, and mats. Seeds are a common food for ducks, marsh birds, and songbirds. Geese will eat the stems and underground parts. The dense cover is important nesting area for waterfowl, marsh wrens, and blackbirds, as well as protection for small mammals.

Appendix D

Common Wildlife of the Bay Trail

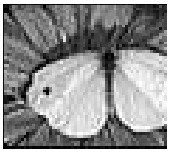


Ant, Argentine *(Linepithema humile*): A light to dark brown ant (2.5 millimeters in size). Walks in lines. Lives under boards, stones, and concrete. Seldom bites, does not sting. A frequent house invader. Preys on termites. If nest is flooded, lines of ants will carry white pupae to higher ground. Nests have multiple queens. Workers are all female.

Ant, Pavement *(Tetramorium caespitum)*: A light to dark brown or blackish ant about 2.5 millimeters in size. Parallel lines on head and thorax. Common in lawns, under stones, and along the edge of pavement in sandy or rocky areas, and in woodwork and masonry. Practically omnivorous. There is one functional queen per colony.

Avocet, American *(Recurvirostra americana)*: A large shorebird with long legs and a long upward-curved bill. Tawny head and neck during breeding season. Size from 38 to 51 centimeters. Inhabits shallow ponds, marshes, and mudflats. Feeds by working its bill from side to side while walking through the water.

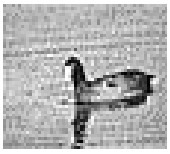
Butterfly, Anise Swallowtail *(Papilio zelicaon)*: A large butterfly with black and yellow patterning about 15 centimeters from wingtip to wingtip. Adults fly from March to September and hibernate as pupae. Larva is yellow, black, and white ringed and emits a foul smell when disturbed. Host plants include Queen Anne's lace *(Daucus carota)*, poison hemlock *(Conium maculatum)*, and fennel *(Lomatium californicum)*. Fennel, an introduced plant which grows abundantly in disturbed areas, has become a favorite host plant.



Butterfly, Cabbage White *(Pieris rapae):* A white butterfly with solid gray tips to the front wing that reaches 4 to 6 centimeters from wing tip to wing tip. Females have three black spots on the wing, males only two. Adults fly from early spring to fall, and hibernate as pupae. Host plants include those of the mustard family, notably Black Mustard (*Brassica nigra*) and Wild Radish (*Raphanus sativus*). Mustard oils derived from host plants are poisonous to birds. Found throughout the United States. Females can live up to three weeks and lay up to 700 eggs.

Butterfly, Sandhill Skipper (*Polites sabuleti*): A small brownish butterfly with pale yellow spots on the underside of the hind wing in a semi-circular pattern. Spots tend to be elongated. Size from 4 to 5 centimeters. Adults fly April through September. Hibernate as pupae. Host plant is salt grass (*Distichlis spicata)*. Range throughout California as several named subspecies. Also throughout North America west of the Rocky Mountains.

Butterfly, Western Pygmy Blue *(Brephidium exile)*: A small blue butterfly with a row of iridescent spots near the margin of the underside of the hind wing. Only 2 to 3 centimeters from wingtip to wingtip. Adults fly March to September. Hibernate as pupae. Found near salt water marsh habitats. Host plants include Saltbush (*Atriplex leucophylla*) and Fat Hen (*Atriplex patula v. hastata*). Range throughout California and the United States. Moves its hind wings while nectaring to draw attention to its "eye spots".

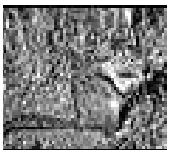


Coot, American (also called a Mud Hen, *Fulica americana)*: A dark bird, 33 to 41 centimeters with a white, chicken-like bill, white rear, and long greenish legs with lobed toes. It prefers fresh water during the summer and lives in both fresh and salt water in the winter. Feeds on the shore and in the water. Pumps its head back and forth when swimming.

Egret, Snowy *(Egretta thula)*: A slender, white bird, 51 to 66 centimeters in size with black bill, black legs and yellow feet. Feathery back and neck plumes visible during breeding season. Inhabits marshes, ponds and tidal flats. Slowly recovering from near extinction in the early 1900s.

Goose, Canada *(Branta canadensis)*: Identifiable by black head and neck with white cheek patch. Reaches 60 to 100 centimeters in size. Inhabits marshes, ponds, lakes, and rivers. Geese fly in a "V" formation when migrating. Pairs are usually mated for life. Their call is a nasal "honk".

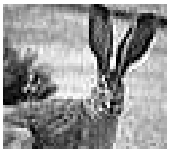
Gopher, Western Pocket *(Thomomys mazama)*: A thick bodied rodent ranging in size from 15-30 centimeters. They are burrowing rodents with fur lined pouches inside their mouth in which they carry foods such as roots, bulbs, grasses, and seeds. They eat a wide variety of plant foods and are a threat to cultivated gardens and lawns. Their mounds tend to be fan shaped with dirt piled mainly on one side of the hole. The hole may be open or filled with loose dirt which allows air to seep into the burrow. They have mottled brown fur, spade like front paws, and no visible ears. Gophers use their keen sense of smell to locate food. They mate and produce young from January to April. They generally have one litter averaging five young per year, and they live for up to 12 years.



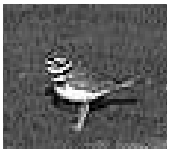
Ground Squirrel, California *(Spermophilus beecheyi):* Brown to gray coat with white wash on sides and neck and dark band down its back. Grows to 36-48 centimeters. Prefers grasslands and open areas with low vegetation. Easily observed feeding in open areas and running in and out of their multi-chambered tunnels.

Gull, California *(Larus californicus):* 20-23 centimeters in size. Gray back, white-spotted black wing tips, greenish legs. Inhabits inland lakes and ponds during breeding season, and is more coastal in the winter.

Heron, Great Blue *(Ardea herodias)*: A large slender bluish bird with long legs. Reaches 1 to 1.3 meters in size. Yellowish bill and white face. Black plumes extend back from eye. Inhabits wetlands and the margins of ponds, lakes, and watercourses. Stalks fish and frogs in still, shallow waters.

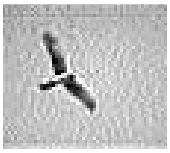


Jackrabbit, Black-tailed *(Lepus californicus):* A large gray or tan rabbit with long black-tipped ears and black-streaked tail. Grows to 51-64 centimeters. Prefers prairies and open areas. Can hop up to 3 meters at a time and reach speeds up to 35mph(56kph). Most active in late afternoon and evening.

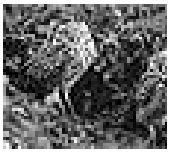

Killdeer (*Charadrius vociferus)*: A member of the plover family. Runs in quick short sprints. 20 to 28 centimeters; a brown bird with a white breast, two black neck bands, and rump that shows orange in flight. Sexes are similar. Call is shrill "kill-dee" repeated continuously. Found in fields, parks, pastures, and open areas. Nest is a small, smooth depression on the ground. Adults feign injury to lure intruders away from nesting area.

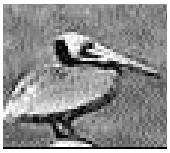

Rough Keyhole Limpet *(Diodora aspera)*: A mollusk with a flattened cone-shaped shell that reaches about 5 centimeters in diameter. The shell has a hole in the top. Found intertidally on rocks and kelp. Its color is from white to tan and gray and is dependent on the types of organisms that are colonizing its surface. Like most marine mollusks, the limpet feeds with a toothed radula, living off of tiny prey it finds on the surfaces it traverses.

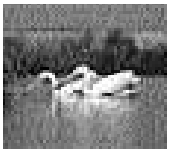

Mallard Duck *(Anas platyrhynchos):* The male has a green head, white collar, and chestnut breast. The female is mottled brown. Both have a metallic blue speculum. They inhabit ponds and marshes. They are the ancestors of the domestic duck. Their call is a loud quack.

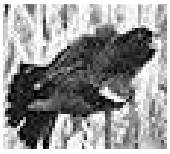

Marsh Hawk, also Northern Harrier *(Circus cyaneus):* A large hawk (45 to 56 centimeters) with long wings and tail, and a white rump. Has a slow sailing flight with wings held in a shallow "v" when it glides low over grasslands and marshes. It's nest is a platform of sticks and grass on the ground. The female which is brown overall lays 3 to 9 bluish white speckled eggs. The males are gray with black wingtips. Juveniles have an orange underside.

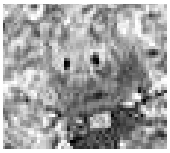

Mussel, Edible/Blue *(Mytilus edulis)*: A mollusk with a blue-black shell that grows to about 5 centimeters in size. Oval shaped and relatively smooth. Inhabits intertidal waters. Common on exposed shores. Often found attached to pilings and other marine objects. Mouth has a ribbon like toothed radula for breaking down food and capturing prey. Since mussels are attached, they feed on tiny prey suspended in tidal waters.

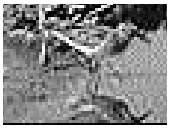

Owl, Burrowing (*Athene cunicularia)*: This species of special concern has seen its numbers dwindle due to loss of habitat. A natural inhabitant of open grasslands and is the only owl that routinely lives and nests underground. It does not dig its own burrow, but depends on ground dwelling mammals such as ground squirrels to dig its home.


Pelican, Brown *(Pelecanus occidentalis)*: A stout, brownish bird with a light colored head and long, pouched beak. Feet are webbed. Grows to 1 to1.5 meters. Lives mainly along the coast, occasionally in the baylands. Slow flier. Skims along the water's surface and catches fish by plunging into the ocean/bay. Often perched on piers along the coast.

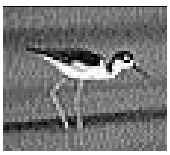

Pelican, White *(Pelecanus erythrorhynchos)*: A stout white bird reaching 1 to 1.5 meters in size, with long pouched beak and webbed feet. Found on inland lakes and bays. This slow flier skims along the water's surface, and plunges in to catch fish. Often seen in flocks.

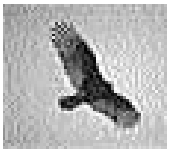

Red Winged Blackbird *(Agelaius phoeniceus)*: The black male has a distinctive red shoulder patch and has a distinctive song (a loud, high pitched chirp followed by a squeaky trill down the scale). The female is brown, looking somewhat like a large sparrow. Size is 18 to 23 centimeters. They inhabit sloughs, marshes, and wet fields. Nests are usually in reeds or tall grass near water. They are normally found in large flocks.


Salt Marsh Harvest Mouse *(Reithrodontomys raviventris)*: Endangered species found in the salt marshes of San Francisco Bay. A nocturnal creature, this tiny mouse(6 to 8 centimeters long) feeds on pickleweed and is prey to raptors.


Sandpiper, Least (*Calidris minutilla)*: A small brownish bird 13 to 18 cm in size. Short thin bill and yellowish legs. Inhabits mudflats, shorelines, and wet fields. A common shore bird. Call is a "peep".


Song Sparrow *(Melospiza melodia)*: A gray/brown bird with heavily streaked breast where streaks converge to a central spot. Tail is rounded. Size is 13 to 18 centimeters. Very common in bushes and woodlands near water. Forages along the ground. Melodious song usually begins with 3 to 4 similar notes.


Stilt, Black-necked *(Himantopus mexicanus)*: A very long-legged black and white wader with a thin bill. Size 30 to 38 centimeters. Found in mudflats of sea and lake shores. Common in both fresh and saltwater habitats.


Turkey Vulture *(Cathartes aura)*: Large, brown black bird, 66 to 81 centimeters in size, with a naked red head. Inhabits dry, open country. Feed on carrion, often along roadsides. Also called a buzzard.

Wildlife of Sunnyvale Baylands Park

Appendix E

Mammals

Black-tailed hare
Botta's pocket gopher
California ground squirrel
Salt marsh harvest mouse
Jackrabbit
Feral house cat

Endangered Species

Due to its unique environment, the San Francisco Bay area is home for many species of plants and animals found nowhere else in the world. As people have encroached on their habitat, some species have disappeared and populations of others have decreased to the point where they are in danger of extinction. To put species on the road to recovery, federal and state governments have listed them according to the threat to their survival. Once listed as an endangered or threatened species, actions are taken to aid that species' recovery.

Loss of habitat is the main reason why some species of wildlife are threatened with extinction. For example, over 85% of the wetlands surrounding San Francisco Bay have been converted to salt ponds, agriculture, industry, airports and housing developments. Pollution, competition and predation from introduced species, and over harvesting also contribute to species decline.

By preserving plant and animal species, we maintain a diversity of life that is essential for a healthy environment. We can protect endangered species by preserving habitat and open space for wildlife. Disposing of wastes properly and picking up litter can make our environment safer for wildlife and ourselves.

The **salt marsh harvest mouse** is an endangered species found only in San Francisco Bay area. Uniquely adapted to its habitat, the salt marsh harvest mouse can drink brackish water and eat pickle-weed. An important part of the food chain, the salt marsh harvest mouse eats vegetation produced in part by the sun, and in turn is eaten by many animals at the top of the food chain such as hawks and egrets. Most of the mouse's habitat has been fragmented, leaving small parcels of salt marshes here and there, making it difficult for the mouse to breed and disperse. An important part of the recovery of the endangered salt marsh harvest mouse population is acquisition of suitable habitat. At Sunnyvale Baylands Park, habitat was created specifically to replace or mitigate for loss of salt marsh harvest mouse habitat elsewhere.

Species of Special Concern

Loss of habitat due to agricultural conversion and urban expansion is the major factor for the **burrowing owl**'s decline and listing as a Species of Special Concern under the California Endangered Species Act. Active during the day, burrowing owls are usually seen guarding the entrance to their burrows. Burrowing owls use previously excavated burrows of ground squirrels for their home. To encourage nesting, artificial burrows were installed at Sunnyvale Baylands Park.

Birds

The most visible wildlife at the park are birds. Some are found here year around and others migrate with the changing seasons. You may see kestrels perched on posts overlooking the seasonal wetlands and grasslands in search of prey. Other birds that can be observed year around include the burrowing owl, loggerhead shrike, and killdeer. During high tides and storms, shorebirds come in from the bay to rest and feed. This bird list is not meant to be inclusive and only lists birds sighted along the paths within the park.

	Winter	Spring	Summer	Autumn
Owls				
Burrowing owl	f	f	f	f
Woodpeckers				
Northern flicker	f	-	-	-
Flycatchers				
Say's phoebe	f	f	-	f
Black phoebe	f	f	f	f
Swallows				
Cliff swallow	-	a	a	a
Barn swallow	-	a	a	a
Crows				
American crow	f	f	f	f
Wrens				
Marsh wren	f	f	f	f
Shrikes				
Loggerhead shrike	f	f	f	f
Warblers				
Yellow-rumpled warbler	f	-	-	f
Common yellowthroat	f	-	-	f
Sparrows, Blackbirds, Starlings				
Savannah sparrow	f	f	f	f
White-crowned sparrow	f	f	-	f
Western meadowlark	c	f	f	c
Red-winged blackbird	a	c	f	c
Brewer's blackbird	a	c	f	c
European starling	a	c	f	c

a = abundant; see in numbers
c = common; usually seen in habitat
f = few; present, occasionally seen
r = rare; rarely seen, occurs every year

	Winter	Spring	Summer	Autumn
Grebes				
Pied-billed grebe	f	f	f	f
Horned grebe	f	f	-	f
Pelicans, Cormorants				
American white pelican	f	r	f	f
Double-crested cormorant	f	f	r	f
Herons				
Snowy egret	f	f	f	f
Great egret	f	f	f	f
Great blue heron	f	f	f	f
Waterfowl				
Northern pintail	f	f	-	f
Blue-winged teal	r	r	-	r
Gadwall	c	c	f	f
Green-winged teal	c	f	-	f
American widgeon	f	f	-	-
Cinnamon teal	f	f	-	f
Ruddy duck	c	a	-	f
Mallard	c	c	f	f
Northern shoveler	a	f	-	f
Lesser scaup	f	-	-	f
Bufflehead	f	-	-	f
Common goldeneye	f	-	-	-
Canada goose	f	f		f
Hawks, Falcons				
Turkey vulture	f	f	f	f
Red-tailed hawk	f	f	f	f
Northern harrier	f	f	f	f
White-tailed kite	f	f	-	f
American kestral	f	f	f	f
Pheasants				
Ring-necked pheasant	f	f	f	f
Rails				
Common moorhen	f	f	f	f
American coot	a	c	f	f
Sora	f	f	-	f
Shorebirds				
Semi-palmated plover	-	f	f	-
Killdeer	c	c	c	c
American avocet	f	f	f	f
Black-necked stilt	f	c	c	f
Long-billed curlew	f	-	-	f
Greater yellowleg	f	-	-	f
Dowitcher	f	f	-	f
Sandpiper	f	f	-	f
Doves				
Mourning dove	f	f	f	f
Rock dove	f	f	f	f

Resources

Appendix F

Don Edwards San Francisco Bay National Wildlife Refuge
Environmental Education Center
Nature center, restrooms, bird watching, hiking, picnicking.
Call for information about interpretive programs
Alviso, CA (408) 262-5513 *www.desfbay.fws.gov*

Acterra-Environmental Library
3921 East Bayshore Rd., Palo Alto, CA 94303-4303
(650) 962-9876
email: info@BAA-PCCF.org
www.acterra.org

Sunnyvale Baylands Park
Birdwatching, hiking, picnicking, restrooms. **Dogs not permitted.**
999 E. Caribbean Drive at Highway 237 (408) 730-7311, *www.ci.sunnyvale.ca.us/baylands*

City of Sunnyvale, Water Pollution Control Plant
1444 Borregas Ave., Sunnyvale, CA 94089,
P.O. Box 3707, Sunnyvale, CA 94088-3707
(408) 730-7717
Tours available; call Monday thru Friday 8am-5pm for information. Children must be at least 1st grade level/age.

SMaRT Station City of Sunnyvale recycling and transfer station serves waste management for the cities of Sunnyvale, Mountain View and Palo Alto.
Tours available. Children must be at least 10 years of age to participate in a tour.
301 Carl Road, Sunnyvale, CA 94089
www.ci.sunnyvale.ca.us/recycle
(408) 752-8530 x 503

Palo Alto Baylands Nature Preserve & Interpretive Center
2775 Embarcadero, CA 94303
(650) 329-2506
Multi-use trails, bird watching interpretive center; open 8am-sunset daily.
www.ci.palo-alto.ca.us/ross/naturepreserve/baylands.html

Environmental Volunteers Inc.
3921 East Bayshore Road, Palo Alto, CA 94303
(650) 961-0545
www.evols.org
Hands-on natural science education for classroom and field. Grades kindergarten through 6. Covers baylands ecology, marine, water, urban ecology, forest/foothill ecology, earthquake education. Services booked 6-12 months in advance. Provides a full semester of training for volunteers in all programs, as well as single subject training throughout the year. Certificate in Environmental Education for teachers through San Jose State University. Call for information on services, training, fees, and application forms.

Santa Clara Valley Water District
5750 Almaden Expressway, San Jose, CA 95118
(408) 265-2607 x2331 *www.scvwd.dst.ca.us/school*
A variety of free resources for teachers, tour of recharge facility, and treatment plant, videos, tapes, CD-ROMs, books for loan. Also has an extensive resource directory for environmental education that provides materials and/or program support in the Bay Area, visit the website at *http://www.scvwd.dst.ca.us/school/edudir.htm*

California Department of Pesticide Regulation
www.cdpr.ca.gov Go to >programs and services>Endangered Species Project.
This website has information and photographs of endangered species in California.

Educational Materials/Curriculum

Habitat Fun Pack - Wetland activities for teachers; California Central Valley Joint Venture, U.S. Department of the Interior, Fish and Wildlife Service, 1002 N.E. Holladay, Portland, Oregon 97232 (Grades K-3, 4-6, Junior & Senior High) (530) 934-2801, ask for Interpretive specialist. *www.fws.gov*

Project WILD Aquatic Activities - Environmental education activities with focus on marine and fresh-water habitats, California Department of Fish and Game, 1416 Ninth Street, Sacramento, CA 95814 (888) 945-3334. *www.dfg.ca.gov/coned/projectwild*

Wading Into Wetlands - Ranger Rick Nature Scope, National Wildlife Federation, 1412 16th Street N.W., Washington, D.C. 20003 - lesson plans, activities, and ideas (Grades K-6) *www.nwf.org*

Water Precious Water - Water activities and experiments emphasizing the physical properties of water and soil. Project AIMS Education Foundation, P.O. Box 7766, 5629 E. Westover Street, Fresno, CA 93747 (Grades K-8) *www.aimsedu.org*

Common Riparian Plants of California, A Field Guide for the Layman Faber and Holland. Pickleweed Press. 212 Del Cosa; Mill Valley, CA 94941: (415) 388-6002.

Common Wetlands Plants of Coastal California Faber. Pickleweed Press.
212 Del Cosa; Mill Valley, CA 94941: (415) 388-6002.

Salt Marsh Manual - An Educator's Guide, Publication of the Environmental Education Center, Don Edwards San Francisco Bay National Wildlife Refuge. (510) 792-0222. Ask for education staff. *www.destbay.fws.gov*

Wow! The Wonders of Wetlands: An Educator's Guide

Books and Videos for Adults

Take This Walk With Me in the Foothills! -multiple-award-winning video of easy trail strategies for beginner to advanced outdoor educators, teachers, and parents, 1998, Environmental Volunteers & Gregg Hansen Productions, (650) 961-0545.

Exploring Our Baylands by Diane Conradson, PhD

Weeds of the West. Western Society of Weed Science, Western U.S. Land Grant Universities

Cooperative Extension Services and the University of Wyoming. *www.anrcatalog.ucdavis.edu*

San Francisco Bay Shoreline Guide. University of California Press, Berkeley, 1995. *www.coastalconservation.ca.gov/publications/pubs.htm*

The Field Guide to Wildlife Habitats of the Western United States by Janine M. Benyus, Simon and Schuster Inc., N.Y., 1989

Simon and Schuster's Guide to Insects by Dr. Ross H. Arnett Jr. and Dr. Richard L. Jacques Jr., Simon and Schuster, New York, NY, 1981.

An Island Called California by Elna S. Bakker, University of California Press, Berkeley, CA, 1971.

The Ohlone Past and Present - Native Americans of the San Francisco Bay Region by Lowell John Bean, Ballena Press, Novato, CA, 1994.

Sharing Nature With Children by Joseph Cornell, Ananda Publications, Nevada City, CA, 1979.

The Way We Lived, California Indian Reminiscences, Stories, and Songs compiled and edited by Malcolm Margolin, Heyday Books, Berkeley, CA, 1981.

Passing Forms and Enduring Values by Yvonne Jacobson, Tioga Press, Menlo Park, CA, 1984

Ecology, a Golden Guide by Alexander and Fichter, Golden Press, New York, N.Y. 1973

The Peterson Field Guide Series, 22 plus volumes, various authors, Houghton Mifflin Co, Boston, MA.
#2, A Field Guide to Western Birds by Roger Tory Peterson, 1961.
#22, A Field Guide to Pacific States Wildflowers by Theodore F. Niehaus, 1976.

There are many field guides on various subjects available: Peterson Field Guides; Audubon Society Guides; The Nature Company Guides and Golden Guides. Most are available at local bookstores.

Books for Children

Keepers of the Earth, Joseph Bruchac and Michael Caduto, Fulcrum Inc., Golden, CO. 1988

Just a Dream by Chris Van Allsburg, Houghton Mifflin Co., Boston, 1990

The Lorax by Dr. Seuss, Random House, N.Y., 1971

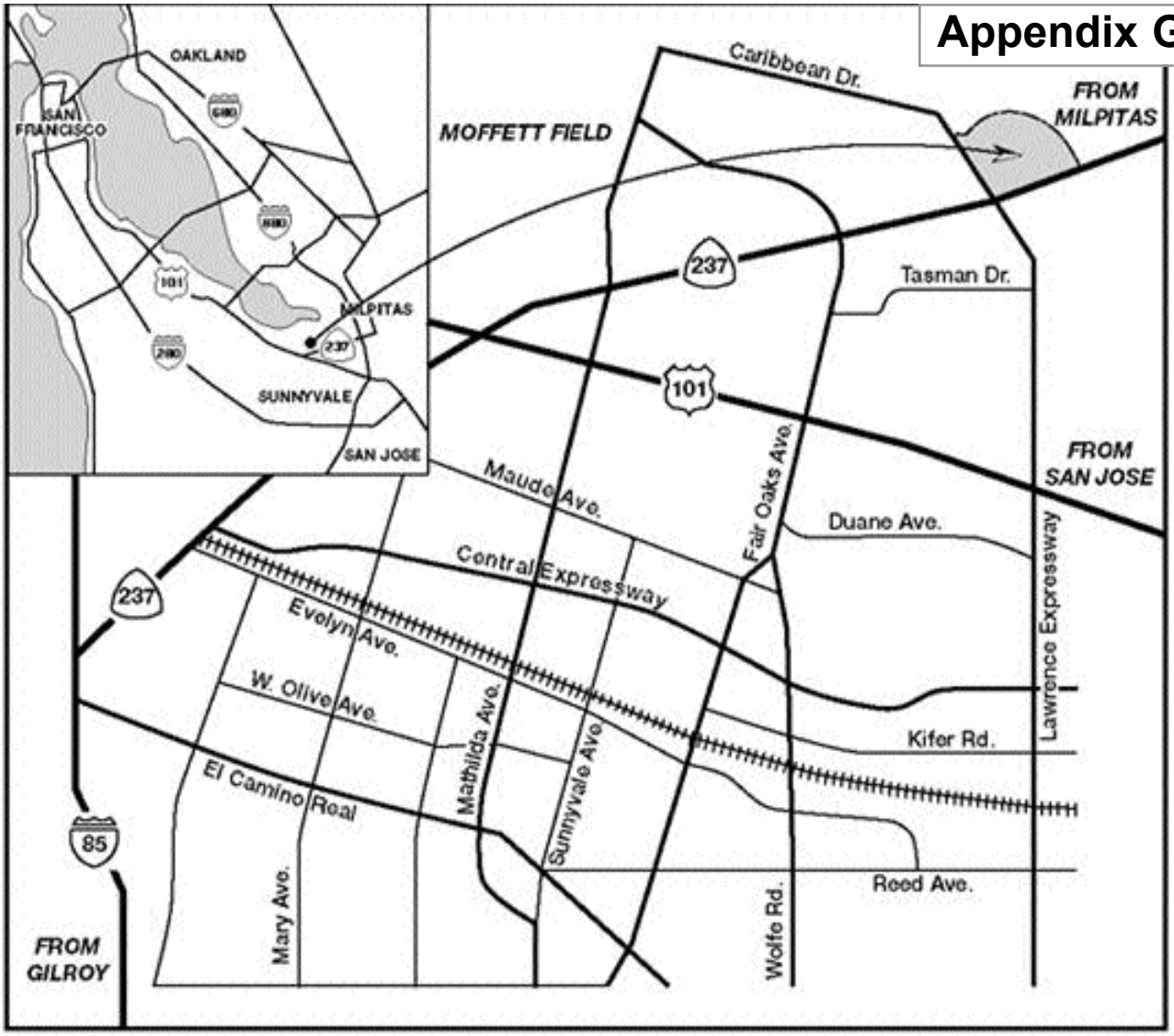
Hawk, I'm Your Brother by Byrd Baylor, Aladdin Publishers, N.Y., 1976

The Way to Start a Day by Byrd Baylor, Aladdin Publishers, N.Y., 1977

Nature Through Science and Art by Susie Criswell, Tab Books, 1986

When the Wind Stops by Charlotte Zolotow, Harper Collins, N.Y. 1995

Brother Eagle Sister Sky by Susan Jeffers, Dial Books, N.Y. 1991



Hailstones and Halibut Bones by Mary O'Neill, Doubleday, N.Y. 1961

Directions to the Bay Trail in Sunnyvale

Directions to access points on the Sunnyvale portion of the Bay Trail

Carl Road Trailhead - from Caribbean Drive, turn right at Borregas Avenue then left onto Carl Road at the Sunnyvale Water Pollution Control Plant. Proceed to the end. Park in one of the public spaces provided. From the trailhead, one can go east behind the water treatment plant and the SMaRT station or west behind Lockheed property to the edge of Moffett Field. The trail is marked.

Sunnyvale Baylands Park - enter the park by making the first right turn after coming over 237 onto Caribbean Drive (at Moffett Park Drive). Turn right after entering the park and proceed (observe the speed limit please) to the end of the park. Park near the restrooms and walk through the gate along the access road. Turn left onto the trail before crossing the bridge at Calabazas Creek. The trail is marked.

Note: Remember that dogs are allowed on the Bay Trail if they are kept on a 6 foot leash and not allowed to disturb wildlife. **Dogs are not allowed in Sunnyvale Baylands Park**, so if you wish to bring a dog on your hike, please use the Carl Road entrance.